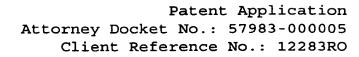
### CLAIMS

#### What is claimed is:

- 1 1. A method for routing data within an optical network
- 2 having a plurality of network nodes, the method
- 3 comprising the steps of:
- 4 receiving data at a first network node via a first
- 5 optical signal having a first wavelength, the first
- 6 wavelength corresponding to a first optical frequency,
- 7 the first optical frequency being mapped to a first
- 8 binary representation, the first binary representation
- 9 being divided into a first plurality of fields, at least
- 10 one of the first plurality of fields corresponding to a
- 11 routing label in a first label stack, a top routing label
- 12 in the first label stack indicating a second network
- 13 node; and
- based at least partially upon the top routing label,
- 15 transmitting the data from the first network node to the
- 16 second network node via a second optical signal having a
- 17 second wavelength.

- 1 2. The method as defined in claim 1, further comprising
- 2 the step of:
- popping the top routing label off the first label
- 4 stack so as to promote a next routing label in the first
- 5 label stack.
- 1 3. The method as defined in claim 2, wherein the second
- 2 wavelength corresponds to a second optical frequency, the
- 3 second optical frequency being mapped to a second binary
- 4 representation, the second binary representation being
- 5 divided into a second plurality of fields, at least one
- 6 of the second plurality of fields corresponding to a
- 7 routing label in a second label stack, a top routing
- 8 label in the second label stack indicating a third
- 9 network node.
- 1 4. The method as defined in claim 3, wherein the top
- 2 routing label in the second label stack corresponds to
- 3 the next routing label in the first label stack.



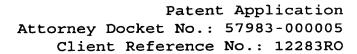
- 1 5. The method as defined in claim 4, wherein the
- 2 network accommodates  $2^N$  frequencies in the form of,
- $f_i = f_0 + i \cdot \Delta f$
- 4 wherein  $i = 0, 1, \dots 2^{N} 1$ , wherein the second optical
- 5 frequency is defined by,

$$f_{i_{out}} = f_0 + 2^L \left( \left( f_{i_{in}} - f_0 \right) - 2^{N-L} I.\Delta f \right)$$

7 and,

$$i_{out} = 2^{L} \left( i_{in} - 2^{N-L} I \right)$$

- 9 wherein  $f_{in}$  represents the first optical frequency, l
- 10 represents the value of the top routing label in the
- 11 first label stack, and L represents the bit length of the
- 12 top routing label in the first label stack.
  - 1 6. The method as defined in claim 1, further comprising
  - 2 the step of:
  - 3 swapping the top routing label in the first label
  - 4 stack with a new routing label when the first label stack
  - 5 contains more than two routing labels.
  - 1 7. The method as defined in claim 6, wherein the second
  - 2 wavelength corresponds to a second optical frequency, the



3 second optical frequency being mapped to a second binary

- 4 representation, the second binary representation being
- 5 divided into a second plurality of fields, at least one
- 6 of the second plurality of fields corresponding to a
- 7 routing label in a second label stack, a top routing
- 8 label in the second label stack indicating a third
- 9 network node.
- 1 8. The method as defined in claim 7, wherein the top
- 2 routing label in the second label stack corresponds to
- 3 the new routing label.
- 1 9. The method as defined in claim 8, wherein the
- 2 network accommodates  $2^N$  frequencies in the form of,
- $f_i = f_0 + i \cdot \Delta f$
- 4 wherein  $i = 0, 1, \dots 2^{N} 1$ , wherein the second optical
- 5 frequency is defined by,
- $f_{i_{out}} = f_{i_{in}} + 2^{N-L} (l l^1) \Delta f$
- and,
- $i_{out} = i_{in} + 2^{N-L} \left( -l^1 \right)$
- 9 wherein  $f\!t_{in}$  represents the first optical frequency,  $l^1$

- 10 represents the value of the top routing label in the
- first label stack, l represents the value of the new 11
- routing label, and L represents the bit length of the top 12
- routing label in the first label stack. 13
  - The method as defined in claim 1, further comprising 1 10.
  - the step of: 2
  - pushing a new routing label onto the first label 3
  - 4 stack.
  - The method as defined in claim 10, wherein the 1
  - to a second optical second wavelength corresponds 2
  - frequency, the second optical frequency being mapped to a 3
  - binary the second second binary representation, 4
  - representation being divided into a second plurality of 5
  - fields, at least one of the second plurality of fields 6
  - corresponding to a routing label in a second label stack, 7
  - a top routing label in the second label stack indicating 8

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a third network node. 9

- 1 12. The method as defined in claim 11, wherein the top
- 2 routing label in the second label stack corresponds to
- 3 the new routing label.
- 1 13. The method as defined in claim 12, wherein the
- 2 network accommodates  $2^N$  frequencies in the form of,

$$f_i = f_0 + i \cdot \Delta f$$

- 4 wherein  $i = 0, 1, \dots, 2^{N}-1$ , wherein the second optical
- 5 frequency is defined by,

$$f_{i_{out}} = f_0 + \left\lfloor \frac{\left( f_{i_{in}} - f_0 \right)}{\Delta f} \right\rfloor 2^{-L} \Delta f + 2^{N-L} I \Delta f$$

7 and,

$$i_{out} = \left\lfloor \frac{i_{in}}{2^L} \right\rfloor + 2^{N-L} I$$

- 9 wherein  $f_{l_{in}}$  represents the first optical frequency, l
- 10 represents the value of the top routing label in the
- 11 second label stack, and L represents the bit length of
- 12 the top routing label in the second label stack.
  - 1 14. The method as defined in claim 1, wherein the first
  - 2 wavelength is the different from the second wavelength.

- 1 15. The method as defined in claim 1, wherein the first
- 2 wavelength is the same as the second wavelength.
- 1 16. The method as defined in claim 1, wherein at least
- 2 another one of the first plurality of fields corresponds
- 3 to a termination field indicating an end of the first
- 4 label stack.
- 1 17. The method as defined in claim 1, wherein at least
- 2 another one of the first plurality of fields corresponds
- 3 to a contention field for differentiating the first
- 4 wavelength from a third wavelength.
- 1 18. The method as defined in claim 17, wherein the data
- 2 is a first data, wherein second data is received at the
- 3 first network node via a third optical signal having the
- 4 third wavelength, and wherein the first optical signal
- 5 and the third optical signal have similar routing paths
- 6 through the network.

- 1 19. An apparatus for routing data within an optical
- 2 network having a plurality of network nodes, the
- 3 apparatus comprising:
- an optical receiver for receiving data at a first
- 5 network node via a first optical signal having a first
- 6 wavelength, the first wavelength corresponding to a first
- 7 optical frequency, the first optical frequency being
- 8 mapped to a first binary representation, the first binary
- 9 representation being divided into a first plurality of
- 10 fields, at least one of the first plurality of fields
- 11 corresponding to a routing label in a first label stack,
- 12 a top routing label in the first label stack indicating a
- 13 second network node; and
- an optical transmitter for transmitting, based at
- 15 least partially upon the top routing label, the data from
- 16 the first network node to the second network node via a
- 17 second optical signal having a second wavelength.
  - 1 20. The apparatus as defined in claim 19, wherein the
  - 2 first wavelength is the different from the second
  - 3 wavelength.





- 1 21. The apparatus as defined in claim 19, wherein the
- 2 first wavelength is the same as the second wavelength.
- 1 22. The apparatus as defined in claim 19, wherein at
- 2 least another one of the first plurality of fields
- 3 corresponds to a termination field indicating an end of
- 4 the first label stack.
- 1 23. The apparatus as defined in claim 19, wherein at
- 2 least another one of the first plurality of fields
- 3 corresponds to a contention field for differentiating the
- 4 first wavelength from a third wavelength.
- 1 24. The apparatus as defined in claim 23, wherein the
- 2 data is a first data, wherein second data is received at
- 3 the first network node via a third optical signal having
- 4 the third wavelength, and wherein the first optical
- 5 signal and the third optical signal have similar routing
- 6 paths through the network.